REMARKS

Claims 1 and 2 are pending in the application. Favorable reconsideration of the application is respectfully requested.

I. REJECTION OF CLAIMS 1 AND 2 UNDER 35 U.S.C. § 103(a)

Claims 1 and 2 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Kitamura et al. (U.S. Publication No. 2004/0009218) in view of Weissmuller et al. (U.S. Patent No. 6,677,142). The Examiner states that Kitamura et al. discloses a linear amylose with a Mw of not less than 100 kDa and a narrow molecular weight distribution through enzyme synthesis by phosphorylase, wherein the biodegradability of the article formed thereof is excellent. The Examiner further states that Weismuller et al. discloses an alpha-1,4-glucan chain containing polyssacharides for use as tablet fillers. The Examiner contends that it would have been obvious to those skilled in the art to use amylose as a disintegrant in a tablet in order to achieve the effects described in Kitamura et al., wherein biodegradability is equivalent to disintegration.

Applicants respectfully traverse the rejection for at least the following reasons. Neither Kitamura et al. nor Weismuller et al. teach or suggest that the claimed alpha-1, 4-glucan possesses properties necessary for utility as a disintegrant in a tablet. As previously noted, a disintegrant has a unique function, defined as "*a substance used in tablet formulations to cause the tablet to break up on contact with moisture and exert its medical action promptly*" (see page 218 of "Merriam-Webster's Medical Desk Dictionary", attached as Exhibit A). The term "disintegrator" is considered to have the same meaning as "disintegrant" in the field of tablet manufacture. Thus, those skilled in the art would recognize that a disintegrant is specifically added to a tablet containing an active ingredient for the purpose of disintegrating the active ingredient after oral administration. The process of disintegration is well recognized as a physical phenomenon requiring the disintegration agent to be contacted with water and swollen thereafter resulting in the molded tablet to be physically disintegrated.

In contrast, Kitamura et al. merely discloses the use of amylose in order to exert the effects of excellent biodegradability of a pharmaceutical and does not disclose its use in a capsule. According to "Hawley's Condensed Chemical Dictionary Eleventh Ed. 1987", "biodegradability" is defined as "*the susceptibility of a substance to decompose by microorganisms, specifically the rate at which detergents and pesticides and other compounds may be chemically broken down by bacteria and/or natural environmental factors*" (see attached Exhibit B). Thus, the process of biodegradation is well recognized as a biological phenomenon requiring microorganisms or environmental factors to degrade the agent. Additionally, the production processes for preparing a capsule and tablet require differing starting material and forms, wherein i) a capsule is prepared by drying the membrane of a hydrolyzed macromolecule; and ii) a tablet is prepared by molding a solid powder. Because the teachings of Kitamura et al. correspond to an alternate administration form, the teachings of Kitamura et al. are not relevant to the presently claimed invention.

Furthermore, Weismuller et al. merely describes the use of a large amount of α-1,4-glucans having a degree of polymerization of not less than 1230 and not more than 37000, wherein these α-1,4-glucans having high molecular weight act as a diluent for bulk effect, wherein "filler" is considered to have the same meaning as "diluent" in the field of tablet manufacture and is not functionally active thereof. Specifically, page 214 of "Merriam-Webster's Medical Desk Dictionary" (Exhibit A attached) defines "diluent" is "a diluting agent (as the vehicle in a medicinal preparation)". Thus the diluent is used for the purpose of bulk effect. In contrast, the α-1,4-glucans used in the presently claimed invention have a degree of polymerization of not less than 186 and less than 1230 and a very narrow distribution of molecular weight, wherein the lack of high molecular weight, would result in them not exerting a bulking effect and use as a "filler". The respective functions associated with the terms "disintegrant", "biodegradability" and "filler" are clearly distinct from one another, and thus it would be well recognized by those skilled in the art that the properties necessary for a substance to achieve each of the above effects and use would also be distinct thereof.

Through innovative study the present inventors discovered a novel and unexpected property of the claimed alpha-1,4-glucan in the ability to disintegrate the active ingredient in a tablet, and thus discovered a novel and inventive use as a disintegrant thereof. A property that is inherent in the prior art, if not known at the time of the invention, cannot form a proper basis for rejecting a claimed invention as obvious under §103. Obviousness cannot be predicated on what is unknown. See *In re Shetty*, 195 U.S.P.Q. 753, 756-57 (CCPA 1977).

The problem solved by the present invention is directed to the development of a disintegrant for use in a tablet for improved disintegration of the active ingredient therein. None of (i) the problem to be solved, (ii) the mechanism to arrive at the solution, or (iii) the effects obtained therefrom are common between the presently claimed invention and the prior art. As a consequence, it appears that the Examiner has based the outstanding rejection upon ex post facto analysis and mere inference and supposition that those skilled in the art would have expected to have succeeded in achieving the claimed invention.

Because one skilled in the art would have had no reasonable expectation of success, based on the combined teachings of Kitamura and Weismuller that an α-1,4-glucan having a degree of polymerization of not less than 186 and less than 1230 and a dispersity of not more than 1.25 would be a disintegrator in a tablet, prima facie obviousness has not been established. Accordingly, the rejection under 35 U.S.C. §103(a) should be withdrawn.

II. PROVISIONAL DOUBLE PATENTING REJECTION

Claims 1 and 2 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1, 2, 4, 6-12, 18 and 21 of copending Application No. 10/333,267 (Kitamura et al., U.S. Publication No. 2004/0009218) in view of Weissmuller et al. (U.S. 6,677,142). The Examiner contends that claims 1 and 2 of the present application are prima facie obvious over claims 1, 2, 4, 6-12, 18 and 21 of Kitamura et al. in view of Weismuller et al.

Applicants respectfully traverse the rejection. As discussed above, neither Kitamura nor Weismuller disclose or suggest that an α-1,4-glucan having a degree of polymerization of not less than 186 and less than 1230, and a polydispersity of not more than 1.25 has a superior property as a disintegrant for tablets. Because one skilled in the art would have had no reasonable expectation of success, based on the combined teachings of Kitamura and Weismuller that an α-1,4-glucan having a degree of polymerization of not less than 186 and less than 1230 and a dispersity of not more than 1.25 would be a disintegrator in a tablet, prima facie obviousness has not been established. Therefore, the provisional double patenting rejection should be withdrawn.

III. CONCLUSION

Accordingly, claims 1 and 2 are believed to be allowable and the application is believed to be in condition for allowance. A prompt action to such end is earnestly solicited.

Should the Examiner feel that a telephone interview would be helpful to facilitate favorable prosecution of the above-identified application, the Examiner is invited to contact the undersigned at the telephone number provided below.

Should a petition for an extension of time be necessary for the timely reply to the outstanding Office Action (or if such a petition has been made and an additional extension is necessary), petition is hereby made and the Commissioner is authorized to charge any fees (including additional claim fees) to Deposit Account No. 18-0988.

Respectfully submitted,

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stretch, or cause to expand ⟨~ his pupils with atropine⟩ ~ *vi* : to become expanded or swollen ⟨the pupil of the eye ~s and contracts in response to variation in the amount of light⟩

di·la·tion \dī-'lā-shən\ *n* 1 : the state of being dilated : DILATATION 2 : the action of stretching or enlarging an organ or part of the body ⟨~ of the cervix⟩ ⟨~ of the pupil with atropine⟩

di·la·tom·e·ter \ˌdil-ə-'täm-ət-ər, ˌdīl-\ *n* : an instrument for measuring thermal dilatation or expansion esp. in determining coefficients of expansion of liquids or solids — **di·la·to·met·ric** \ˌdil-ət-ə-'me-trik\ *adj* — **di·la·tom·e·try** \ˌdil-ə-'täm-ə-trē, ˌdīl-\ *n, pl* **-tries**

di·la·tor \(')dī-'lāt-ər, də-\ *n* : one that dilates: as **a** : an instrument for expanding a tube, duct, or cavity ⟨a urethral ~⟩ — called also *divulsor* **b** : a muscle that dilates a part **c** : a drug (as a vasodilator) causing dilation

Di·lau·did \(ˌ)dī-'lȯ-did\ *trademark* — used for a preparation of hydromorphone

dil·do \'dil-(ˌ)dō\ *n, pl* **dildos** *also* **dildoes** : an object serving as a penis substitute for vaginal insertion

dill \'dil\ *n* : any of several plants of the family Umbelliferae; *esp* : a European herb (*Anethum graveolens*) with aromatic seeds and foliage that are used in flavoring foods and esp. pickles

dill oil *n* : either of two essential oils derived from the common dill: **a** : a colorless or pale yellow oil having a sweetish acrid taste that is obtained from the dried ripe fruits of the dill and is used as an aromatic carminative and as a flavoring agent **b** : a similar oil obtained from the whole dill plant and used as a flavoring agent

dill·seed oil \'dil-ˌsēd-\ *n* : DILL OIL a

dill·weed oil \-ˌwēd-\ *n* : DILL OIL b

dil·ti·a·zem \dil-'tī-ə-(ˌ)zem\ *n* : a calcium channel blocker $C_{22}H_{26}N_2O_4S$ used esp. in the form of its hydrochloride as a coronary vasodilator — see CARDIZEM

¹dil·u·ent \'dil-yə-wənt\ *n* : a diluting agent (as the vehicle in a medicinal preparation)

²diluent *adj* : making thinner or less concentrated by admixture : DILUTING

¹di·lute \dī-'lüt, də-\ *vt* **di·lut·ed; di·lut·ing** : to make thinner or more liquid by admixture — **di·lut·er** *also* **di·lu·tor** \-ər\ *n*

²dilute *adj* : of relatively low strength or concentration ⟨a ~ solution⟩

di·lu·tion \dī-'lü-shən, də-\ *n* 1 : the action of diluting : the state of being diluted 2 : something (as a solution) that is diluted

dim *abbr* diminished

di·men·hy·dri·nate \ˌdī-ˌmen-'hī-drə-ˌnāt\ *n* : a crystalline antihistamine $C_{24}H_{28}ClN_5O_3$ used esp. to prevent nausea (as in motion sickness)

di·men·sion \də-'men-chən *also* dī-\ *n* : measure in one direction; *specif* : one of three or four coordinates determining a position in space or space and time

di·mer \'dī-mər\ *n* : a compound formed by the union of two radicals or two molecules of a simpler compound; *specif* : a polymer formed from two molecules of a monomer — **di·mer·ic** \(')dī-'mer-ik\ *adj* — **di·mer·iza·tion** *or Brit* **di·mer·isa·tion** \ˌdī-mə-rə-'zā-shən\ *n* — **di·mer·ize** *or Brit* **di·mer·ise** \'dī-mə-ˌrīz\ *vt* **-ized** *or Brit* **-ised; -iz·ing** *or Brit* **-is·ing**

di·mer·cap·rol \ˌdī-(ˌ)mər-'kap-ˌrōl, -ˌrȯl\ *n* : a colorless viscous oily compound $C_3H_8OS_2$ with an offensive odor developed as an antidote to lewisite and used in treating arsenic, mercury, and gold poisoning — called also *BAL, British antilewisite*

di·meth·yl \(')dī-'meth-əl\ *adj* : containing two methyl groups in a molecule — often used in combination

di·meth·yl·benz·an·thra·cene \-ben-'zan(t)-thrə-ˌsēn\ *also* **7,12–di·meth·yl·benz·[*a*]·an·thra·cene** \ˌsev-ən-ˌtwelv-(ˌ)dī-ˌmeth-əl-ben-'zan(t)-thrə-ˌsēn\ *n* : a carcinogenic polycyclic aromatic hydrocarbon $C_{20}H_{16}$ widely used in experimental research on carcinogenesis using animal models (as mice or rats) — abbr. *DMBA*

di·meth·yl·ni·tros·amine \(ˌ)dī-ˌmeth-əl-(ˌ)nī-'trō-sə-ˌmēn\ *n* : a carcinogenic nitrosamine $C_2H_6N_2O$ that occurs esp. in tobacco smoke — called also *nitrosodimethylamine*

di·meth·yl phthalate \(ˌ)dī-ˌmeth-əl-\ *n* : a colorless liquid ester $C_{10}H_{10}O_4$ used chiefly as a plasticizer and insect repellent

di·meth·yl·poly·si·lox·ane \-ˌpäl-ē-sə-'läk-ˌsān, -sī-\ *n* : a polymer of silicone used esp. in pharmaceutical and cosmetic preparations — see SIMETHICONE

dimethyl sulfate *n* : a carcinogenic sulfate $(CH_3)_2SO_4$ containing two methyl groups that is esp. irritating to the respiratory tract

dimethyl sulfoxide *n* : an anti-inflammatory agent $(CH_3)_2SO$ used in the treatment of interstitial cystitis — called also *DMSO*

di·meth·yl·tryp·ta·mine \-'trip-tə-ˌmēn\ *n* : an easily synthesized hallucinogenic drug $C_{12}H_{16}N_2$ that is chemically similar to but shorter acting than psilocybin — called also *DMT*

di·meth·yl·tu·bo·cu·ra·rine \-ˌt(y)ü-bō-kyù-'rär-ən, -ˌēn\ *n* : a derivative of tubocurarine used in the form of a salt (as the chloride $C_{40}H_{48}Cl_2N_2O_6$) as a skeletal muscle relaxant

di·mor·phic \(')dī-'mȯr-fik\ *adj* 1 : DIMORPHOUS 1 2 : occurring in two distinct forms

di·mor·phism \-ˌfiz-əm\ *n* : the condition or property of being dimorphic or dimorphous: as **a** (1) : the existence of two different forms (as of color or size) of a species esp. in the same population (2) : the existence of an organ in two different forms **b** : crystallization of a chemical compound in two different forms

di·mor·phous \(')dī-'mȯr-fəs\ *adj* 1 : crystallizing in two different forms 2 : DIMORPHIC 2

¹dim·ple \'dim-pəl\ *n* : a slight natural indentation or hollow in the surface of some part of the human body (as on a cheek or the chin)

²dimple *vb* **dim·pled; dim·pling** \-p(ə-)liŋ\ *vt* : to mark with dimples ~ *vi* : to exhibit or form dimples

di·ner·ic \(')dī-'ner-ik, də-\ *adj* : of or relating to the interface between two mutually immiscible liquids (as oil and water) contained in the same vessel

dinitrate — see ISOSORBIDE DINITRATE

di·ni·tro·ben·zene \ˌdī-ˌnī-trō-'ben-ˌzēn, -ben-'\ *n* : any of three isomeric toxic derivatives $C_6H_4(NO_2)_2$ of benzene

di·ni·tro–o–cre·sol \ˌdī-ˌnī-trō-ˌō-'krē-ˌsȯl, -ˌsōl\ *also* **di·ni·tro–or·tho–cre·sol** \-ˌȯr-thō-\ *n* : a yellow crystalline compound $C_7H_6N_2O_5$ used esp. as an insecticide and herbicide — called also *DNOC*

di·ni·tro·phe·nol \-'fē-ˌnōl, -fi-'\ *n* : any of six isomeric crystalline compounds $C_6H_4N_2O_5$ some of whose derivatives are pesticides; *esp* : a highly toxic compound that increases fat metabolism and was formerly used in weight control

Di·no·flag·el·la·ta \ˌdī-nō-ˌflaj-ə-'lāt-ə, -'lāt-\ *n pl* : an order of chiefly marine usu. solitary phytoflagellates that are typically enclosed in a cellulose envelope, that have one transverse flagellum running in a groove about the body, one posterior flagellum extending out from a similar median groove, usu. a single nucleus, and yellow, brown, or occas. green chromoplasts, and that include luminescent forms, important elements of marine food chains, and the flagellates of the genera *Gonyaulax* and *Gymnodinium* that cause red tide

di·no·fla·gel·late \ˌdī-nō-'flaj-ə-lət, -ˌlāt, -flə-'jel-ət\ *n* : any of the order Dinoflagellata of phytoflagellates

di·nu·cle·o·tide \(ˌ)dī-'n(y)ü-klē-ə-ˌtīd\ *n* : a nucleotide consisting of two units each composed of a phosphate, a pentose, and a purine or pyrimidine base

Di·oc·to·phy·ma \(ˌ)dī-ˌäk-tə-'fī-mə\ *n* : a genus of nematode worms including a single species (*D. renale*) which is a destructive parasite of the kidney of dogs, minks, and sometimes humans

Di·oc·to·phy·me \-'fī-(ˌ)mē\ *n, syn of* DIOCTOPHYMA

di·o·done \'dī-ə-ˌdōn\ *n* : IODOPYRACET

dis·in·te·grate \(ˈ)dis-ˈint-ə-ˌgrāt\ *vb* **-grat·ed; -grat·ing** *vt* : to break or decompose into constituent elements, parts, or small particles ~ *vi* **1** : to break or separate into constituent elements or parts **2** : to undergo a change in composition ⟨an atomic nucleus that ~*s* because of radioactivity⟩ — **dis·in·te·gra·tion** \(ˌ)dis-ˌint-ə-ˈgrā-shən\ *n*

disintegration constant *n* : DECAY CONSTANT

dis·in·te·gra·tor \(ˈ)dis-ˈint-ə-ˌgrāt-ər\ *n* : one that causes the disintegration of something; *specif* : a substance used in tablet formulations to cause the tablet to break up on contact with moisture and exert its medicinal action promptly

dis·in·ter \ˌdis-ᵊn-ˈtər\ *vt* : to take out of the grave or tomb — **dis·in·ter·ment** \-mənt\ *n*

dis·in·tox·i·cate \ˌdis-ᵊn-ˈtäk-sə-ˌkāt\ *vt* **-cat·ed; -cat·ing** : DETOXIFY 2 — **dis·in·tox·i·ca·tion** \-ˌtäk-sə-ˈkā-shən\ *n*

dis·junc·tion \dis-ˈjəŋ(k)-shən\ *n* : the separation of chromosomes or chromatids during anaphase of mitosis or meiosis

disk *or* **disc** \ˈdisk\ *n* : any of various rounded or flattened anatomical structures: as **a** : a mammalian blood cell **b** : BLIND SPOT **c** : INTERVERTEBRAL DISK — see SLIPPED DISK

disk·ec·to·my *also* **disc·ec·to·my** \dis-ˈkek-tə-mē\ *n, pl* **-mies** : surgical removal of an intervertebral disk

disk·o·gram *also* **disc·o·gram** \ˈdis-kə-ˌgram\ *n* : a radiograph of an intervertebral disk made after injection of a radiopaque substance

dis·kog·ra·phy *also* **dis·cog·ra·phy** \dis-ˈkäg-rə-fē\ *n, pl* **-phies** : the process of making a diskogram

dis·lo·cate \ˈdis-lō-ˌkāt, -lə-; (ˈ)dis-ˈlō-ˌkāt\ *vt* **-cat·ed; -cat·ing** : to put (a body part) out of order by displacing a bone from its normal connections with another bone ⟨he *dislocated* his shoulder⟩; *also* : to displace (a bone) from normal connections with another bone ⟨the humerus was *dislocated* in the fall⟩

dis·lo·ca·tion \ˌdis-(ˌ)lō-ˈkā-shən, -lə-\ *n* : displacement of one or more bones at a joint : LUXATION

dis·mem·ber \(ˈ)dis-ˈmem-bər\ *vt* **dis·mem·bered; dis·mem·ber·ing** \-b(ə-)riŋ\ : to cut off or disjoin the limbs, members, or parts of — **dis·mem·ber·ment** \-bər-mənt\ *n*

dismutase — see SUPEROXIDE DISMUTASE

dis·mu·ta·tion \ˌdis-myü-ˈtā-shən\ *n* : a process of simultaneous oxidation and reduction — used esp. of compounds taking part in biological processes

di·so·di·um \(ˈ)dī-ˈsōd-ē-əm\ *adj* : containing two atoms of sodium in a molecule

disodium cromoglycate *n* : CROMOLYN SODIUM

disodium ed·e·tate \-ˈed-ə-ˌtāt\ *n* : a hydrated disodium salt $C_{10}H_{14}N_2Na_2O_8{\cdot}2H_2O$ of EDTA that has an affinity for calcium and is used to treat hypercalcemia and pathological calcification

di·so·mic \(ˈ)dī-ˈsō-mik\ *adj* : having one or more chromosomes present in twice the normal number but not having the entire genome doubled — **di·so·my** \-mē\ *n, pl* **-mies**

di·so·mus \-məs\ *n, pl* **di·so·mi** \-ˌmī\ *or* **di·so·mus·es** : a 2-bodied teratological fetus

di·so·pyr·a·mide \ˌdī-(ˌ)sō-ˈpi(ə)r-ə-ˌmīd\ *n* : a cardiac depressant $C_{21}H_{29}N_3O$ administered in the form of an association complex with phosphoric acid and used in the treatment of life-threatening ventricular arrhythmias

¹dis·or·der \(ˈ)dis-ˈörd-ər, (ˈ)diz-\ *vt* **dis·or·dered; dis·or·der·ing** \-ˈörd-(ə-)riŋ\ : to disturb the regular or normal functions of

²disorder *n* : an abnormal physical or mental condition : AILMENT ⟨an intestinal ~⟩ ⟨a nervous ~⟩

dis·or·dered *adj* **1** : not functioning in a normal orderly healthy way ⟨~ bodily functions⟩ **2** : mentally unbalanced ⟨a ~ patient⟩ ⟨a ~ mind⟩

dis·or·ga·ni·za·tion *or Brit* **dis·or·ga·ni·sa·tion** \(ˌ)dis-ˌörg-(ə-)nə-ˈzā-shən\ *n* : psychopathological inconsistency in personality, mental functions, or overt behavior ⟨psychotic ~⟩ ⟨psychomotor ~⟩ — **dis·or·ga·nize** *or Brit* **dis·or·ga·nise** \(ˈ)dis-ˈör-gə-ˌnīz\ *vt* **-nized** *or Brit* **-nised; -niz·ing** *or Brit* **-nis·ing**

dis·ori·ent \(ˈ)dis-ˈör-ē-ˌent, -ˈör-\ *vt* : to produce a state of disorientation in : DISORIENTATE ⟨the next day the patient was ~*ed* but not comatose —*Jour. Amer. Med. Assoc.*⟩

dis·ori·en·ta·tion \(ˌ)dis-ˌör-ē-ən-ˈtā-shən, -ˌörˌ-, -ˌen-\ *n* : a usu. transient state of confusion esp. as to time, place, or identity often as a result of disease or drugs — **dis·ori·en·tate** \(ˈ)dis-ˈör-ē-ən-ˌtāt, -ˈörˌ-, -ˌen-\ *vt* **-tat·ed; -tat·ing**

disp *abbr* dispensary

dis·pa·rate \dis-ˈpar-ət, ˈdis-p(ə-)rət\ *adj* : indicating or stimulating dissimilar points on the retina of each eye

dis·par·i·ty \dis-ˈpar-ət-ē\ *n, pl* **-ties** : the state of being different or dissimilar (as in the sensory information received) — see RETINAL DISPARITY

dis·pen·sa·ry \dis-ˈpen(t)s-(ə-)rē\ *n, pl* **-ries** : a place where medicine or medical or dental treatment is dispensed

dis·pen·sa·tion \ˌdis-pən-ˈsā-shən, -ˌpen-\ *n* : the act of dispensing ⟨the ~ of medicines⟩

dis·pen·sa·to·ry \dis-ˈpen(t)-sə-ˌtȯr-ē, -ˌtȯr-\ *n, pl* **-ries** **1** : a book or medicinal formulary containing a systematic description of the drugs and preparations used in medicine — compare PHARMACOPOEIA 1 **2** : DISPENSARY

dis·pense \dis-ˈpen(t)s\ *vt* **dis·pensed; dis·pens·ing** **1** : to put up (a prescription or medicine) **2** : to prepare and distribute (medication)

dispensing optician *n, Brit* : a person qualified and licensed to fit and supply eyeglasses

di·sper·my \ˈdī-ˌspər-mē\ *n, pl* **-mies** : the entrance of two spermatozoa into one egg — compare MONOSPERMY, POLYSPERMY

dis·pers·al \dis-ˈpər-səl\ *n* : the act or result of dispersing; *specif* : the process or result of the spreading of organisms from one place to another

dis·perse \dis-ˈpərs\ *vb* **dis·persed; dis·pers·ing** *vt* : to spread or distribute from a fixed or constant source: as **a** : to subject (as light) to dispersion **b** : to distribute (as fine particles) more or less evenly throughout a medium ~ *vi* : to become dispersed

dispersed phase *or* **disperse phase** *n* : the phase in a two-phase system that consists of finely divided particles (as colloidal particles), droplets, or bubbles of one substance distributed through another substance — called also *discontinuous phase, internal phase*

disperse system *n* : DISPERSION 3b, COLLOID 2b

dis·per·sion \dis-ˈpər-zhən, -shən\ *n* **1** : the act or process of dispersing : the state of being dispersed **2** : the separation of light into colors by refraction or diffraction with formation of a spectrum; *also* : the separation of radiation into components in accordance with some varying characteristic (as energy) **3 a** : a dispersed substance **b** : a system consisting of a dispersed substance and the medium in which it is dispersed : COLLOID 2b — called also *disperse system*

dispersion medium *n* : the liquid, gaseous, or solid phase in a two-phase system in which the particles of the dispersed phase are distributed — called also *continuous phase, external phase*

dis·per·si·ty \dis-ˈpər-sət-ē\ *n, pl* **-ties** : the state or the degree of chemical dispersion

dis·per·sive \-ˈpər-siv, -ziv\ *adj* **1** : of or relating to dispersion ⟨a ~ medium⟩ ⟨the ~ power of a lens⟩ **2** : tending to disperse — **dis·per·sive·ness** *n*

dis·per·soid \-ˌsȯid\ *n* : finely divided particles of one substance dispersed in another

dis·place \(ˈ)dis-ˈplās\ *vt* **-placed; -plac·ing** **1 a** : to remove from the usual or proper place ⟨in heterotopia the gray portions of the cord are *displaced* so that patches of gray matter are scattered among the bundles of white fibers —R. L. Cecil *et al*⟩ **b** : to shift (an emotion or behavior) from a maladaptive or unacceptable object or form of outlet to a more adaptive or acceptable one ⟨~ punishable behavior by directing it towards things that cannot punish —B. F. Skinner⟩ **2** : to set free from chemical combination by taking the place of ⟨zinc ~*s* the hydrogen of dilute acids⟩ **3** : to subject to percolation

dis·place·ment \-ˈplā-smənt\ *n* **1 a** : the act or process of removing something from its usual or proper place or the state

Fick's law \'fiks-\ *n* : a law of chemistry and physics: the rate of diffusion of one material in another is proportional to the negative of the gradient of the concentration of the first material

FICS *abbr* Fellow of the International College of Surgeons

FID *abbr* free induction decay

field \'fē(ə)ld\ *n* **1** : an area or division of an activity ⟨a doctor eminent in her ~⟩ **2** : a complex of forces that serve as causative agents in human behavior **3 a** : a region of embryonic tissue potentially capable of a particular type of differentiation ⟨a morphogenetic ~⟩ **b** : a region or space in which a given effect (as magnetism) exists **4 a** : an area that is perceived or under observation; *esp* : the area visible through the lens of an optical instrument — see VISUAL FIELD **b** : the site of a surgical operation

field fever *n* : a European leptospirosis of humans

field hospital *n* : a military organization of medical personnel with equipment for establishing a temporary hospital in the field

field lens \-ˌlenz\ *n* : the lens in a compound eyepiece that is nearer the objective

field of force *n* : FIELD 3b

field of view \-ˈvyü\ *n* : FIELD 4a

field of vision *n* : VISUAL FIELD

fièvre bou·ton·neuse \ˈfyev-rə-ˌbü-tȯ-ˈnœz\ *n* : BOUTONNEUSE FEVER

fifth cranial nerve \ˈfi(f)th-, ˈfift-\ *n* : TRIGEMINAL NERVE

fifth disease *n* : ERYTHEMA INFECTIOSUM

fifth nerve *n* : TRIGEMINAL NERVE

fifth ventricle *n* : a cavity between the vertical lamina of the septum pellucidum that does not have a channel of communication with the other ventricles of the brain

fig \'fig\ *n* **1** : an oblong or pear-shaped fruit that is a syconium; *esp* : the edible fruit of a widely cultivated tree (*Ficus carica*) that has laxative qualities **2** : any of a genus (*Ficus*) of trees of the mulberry family that produce figs

fig *abbr* figure

fig·ure \ˈfig-yər, *Brit & often US* ˈfig-ər\ *n* **1** : bodily shape or form esp. of a person ⟨a slender ~⟩ **2 a** : the graphic representation of a form esp. of a person **b** : a diagram or pictorial illustration of textual matter **3** : a person who is representative of or serves as a psychological substitute for someone or something else — see FATHER FIGURE

figure–ground \-ˈgraůnd\ *adj* : relating to or being the relationships between the parts of a perceptual field which is perceived as divided into a part consisting of figures having form and standing out from the part comprising the background and being relatively formless ⟨an ambiguous diagram in which ~ relationships are easily perceived as reversed⟩

fila *pl of* FILUM

fil·a·ment \ˈfil-ə-mənt\ *n* : a single thread or a thin flexible threadlike object, process, or appendage; *esp* : an elongated thin series of cells attached one to another or a very long thin cylindrical single cell (as of some algae, fungi, or bacteria) — **fil·a·men·tous** \ˌfil-ə-ˈment-əs\ *adj*

fi·lar \ˈfī-lər\ *adj* : of or relating to a thread or line; *esp* : having threads across the field of view ⟨a ~ eyepiece⟩

fi·lar·ia \fə-ˈlar-ē-ə, -ˈler-\ *n* *1pl* **fi·lar·i·ae** \-ē-ˌē, -ˌī\ : any of numerous slender filamentous nematodes that as adults are parasites in the blood or tissues of birds or mammals and as larvae usu. develop in biting insects (as fleas or mosquitos) that belong to the superfamily Filarioidea, and that for the most part were once included in the genus *Filaria* but are now divided among various genera (as *Wuchereria* and *Onchocerca*) **2** *cap, in former classifications* : a genus of nematodes that included most of the filarial worms

fi·lar·i·al \-ē-əl\ *adj* : of, relating to, infested with, transmitting, or caused by filariae or related parasitic worms

fil·a·ri·a·sis *also* **fil·a·ri·o·sis** \ˌfil-ə-ˈrī-ə-səs\ *n, pl* **-a·ses** *also* **-o·ses** \-ˌsēz\ : infestation with or disease caused by filariae

fi·lar·i·cide \fə-ˈlar-ə-ˌsīd, -ˈler-\ *n* : an agent that is destructive to filariae — **fi·lar·i·cid·al** \-ˌlar-ə-ˈsīd-ᵊl, -ˌler-\ *adj*

fi·lar·i·form \-ə-ˌfȯrm\ *adj, of a larval nematode* : resembling a filaria esp. in having a slender elongated form and in possessing a delicate capillary esophagus

[1]fi·lar·i·id \-ē-əd\ *or* **fi·lar·id** \fə-ˈlar-əd, ˈfil-ər-əd\ *adj* : of or relating to the superfamily Filarioidea or to filariae

[2]filarid *or* **filarid** *n* : FILARIA 1

Fi·lar·i·oi·dea \fə-ˌlar-ē-ˈȯid-ē-ə, -ˌler-\ *n pl* : a large superfamily of nematodes of the order Spirurida that comprises the medically important filarial worms and related forms having a slender thready body, a simple anterior end with the oral lips inconspicuous, a cylindrical esophagus lacking a bulbus, and often unequal and dissimilar copulatory spicules in the male — **fi·lar·i·oid** \fə-ˈlar-ē-ˌȯid, -ˈler-\ *adj*

filariosis *var of* FILARIASIS

filar micrometer *n* : an instrument for accurately measuring small distances or angles that usu. consists of two parallel fine platinum wires mounted in the focal plane of a microscope or telescope with one wire being fixed and the other movable by means of a finely threaded screw

fila terminalia *pl of* FILUM TERMINALE

file \ˈfī(ə)l\ *n* **1** : a tool usu. of hardened steel with cutting ridges for forming or smoothing surfaces (as of a tooth) **2** : a narrow instrument for shaping fingernails with a fine rough metal or emery surface — **file** *vt* **filed; fil·ing**

fil·gras·tim \fil-ˈgras-təm\ *n* : a genetically engineered human granulocyte colony-stimulating factor used to decrease the incidence of infection esp. as manifested by febrile neutropenia in patients affected with nonmyeloid malignant neoplasms — see NEUPOGEN

fil·ial generation \ˈfil-ē-əl-, ˈfil-yəl-\ *n* : a generation in a breeding experiment that is successive to a parental generation — symbol F_1 for the first, F_2 for the second, etc.

fi·lic·ic acid \fi-ˌlis-ik-\ *n* : a phenolic anthelmintic substance that is obtained as a colorless powder from the rhizome of the common male fern

fil·i·cin \ˈfil-ə-sən\ *n* : FILICIC ACID; *also* : the mixture of active principles obtained from the male fern

[1]fi·li·form \ˈfil-ə-ˌfȯrm, ˈfī-lə-\ *adj* : shaped like a filament

[2]filiform *n* : an extremely slender bougie

filiform papilla *n* : any of numerous minute pointed papillae on the tongue

fil·i·pin \ˈfil-ə-pin\ *n* : an antifungal antibiotic $C_{35}H_{58}O_{11}$ produced by a bacterium of the genus *Streptomyces* (*S. filipinensis*)

fill \'fil\ *vt* **1** : to repair the cavities of (teeth) **2** : to supply as directed ⟨~ a prescription⟩

filled milk *n* : skim milk with fat content increased by the addition of vegetable oils

fil·let \ˈfil-ət\ *n* : a band of anatomical fibers; *specif* : LEMNISCUS

fill·ing \ˈfil-iŋ\ *n* **1** : material (as gold or amalgam) used to fill a cavity in a tooth **2** : simple sporadic lymphangitis of the leg of a horse commonly due to overfeeding and insufficient exercise

film \'film\ *n* **1 a** : a thin skin or membranous covering : PELLICLE **b** : an abnormal growth on or in the eye **2 a** : an exceedingly thin layer : LAMINA **b** : a thin flexible transparent sheet of cellulose acetate or cellulose nitrate coated with a radiation-sensitive emulsion for taking photographs or making radiographs

film badge \-ˌbaj\ *n* : a small pack of sensitive photographic film worn as a badge for indicating exposure to radiation

fil·o·po·di·um \ˌfil-ə-ˈpō-dē-əm *also* ˌfī-\ *also* **fil·o·pod** \ˈfil-əˌpäd\ *n, pl* **-po·di·a** \-ˈpō-dē-ə\ *also* **-pods** : a long thin fila-

Hawley's Condensed Chemical Dictionary

ELEVENTH EDITION

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and
Richard J. Lewis, Sr.

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into its component neutrons and protons. Neutron or proton binding energy is that required to remove a neutron or a proton from a nucleus; electron binding energy is that required to remove an electron from an atom or molecule.
See also mass defect, fission.

bioassay. See assay.

"Biobate."[173] TM for an enzymatic preparation for use in bating in the leather industry.

"Biocheck."[108] TM for a family of biocides, fungicides, and slimicides.
Use: Controlling and eliminating microbiological growth in pulp and paper mill water systems as well as for antibacterial papers.

biochemical oxygen demand. (BOD). A standardized means of estimating the degree of contamination of water supplies, especially those which receive contamination from sewage and industrial wastes. It is expressed as the quantity dissolved oxygen (in mg/L) required during stabilization of the decomposable organic matter by aerobic biochemical action. Determination of this quantity is accomplished by diluting suitable portions of the sample with water saturated with oxygen and measuring the dissolved oxygen in the mixture both immediately and after a period of incubation usually five days.
See also sewage sludge, biodegradability, dissolved oxygen (DO), and oxygen consumed (COD) as related terms.

biochemistry. Originally a subdivision of chemistry but now an independent science, biochemistry includes all aspects of chemistry that apply to living organisms. Thus, photochemistry is directly involved with photosynthesis and physical chemistry with osmosis--two phenomena that underlie all plant and animal life. Other important chemical mechanisms that apply directly to living organisms are catalysis, which takes place in biochemical systems by the agency of enzymes; nucleic acid and protein constitution and behavior, which is known to control the mechanism of genetics; colloid chemistry, which deals in part with the nature of cell walls, muscles, collagen, etc.; acid-base relations, involved in the pH of body fluids; and such nutritional components as amino acids, fats, carbohydrates, minerals, lipids and vitamins, all of which are essential to life. The chemical organization and reproductive behavior of microorganisms (bacteria and viruses) and a large part of agricultural chemistry are also included in biochemistry. Particularly active areas of biochemistry are nucleic acids, cell surfaces (membranes), enzymology, peptide hormones, molecular biology, and recombinant DNA.
See also biotechnology.

biocide. General name for any substance that kills or inhibits the growth of microorganisms such as bacteria, molds, slimes, fungi, etc. Many of them are also toxic to humans. Biocidal chemicals include chlorinated hydrocarbons, organometallics, halogen-releasing compounds, metallic salts, organic sulfur compounds, quaternary ammonium compounds, and phenolics.
See also antiseptic, disinfectant, fungicide, bactericide.

biocolloid. An aqueous colloidal suspension or dispersion produced by or within a living organism. Blood, milk, and egg yolk are examples.

biocomputer. A computer in which the silicon in the microchips has been replaced by a synthetic protein or polypeptide coated with a silver compound, the combination behaving as a metallic semiconductor. Such chips have been made experimentally, they have the potential of improving the storage capacity and operating efficiency of silicon chips substantially. The materials used in the experimental chips were polylysine on a glass substrate coated with an acrylate polymer and treated with silver nitrate.

bioconversion. Utilization of animal manures, garbage, and similar organic wastes for production of fuel gases by digestion, gasification, or liquefaction.
See also biogas, biomass.

biocytin. (epsilon-N-biotinyl-L-lysine). $C_{16}H_{28}N_4O_4S$.
Properties: A naturally occurring complex of biotin isolated from yeast. Water-soluble crystals, mp 228.5C. It is believed to be an intermediate in the utilization of biotin by animal organisms.

biodegradability. The susceptibility of a substance to decompose by microorganisms, specifically the rate at which detergents and pesticides and other compounds may be chemically broken down by bacteria and/or natural environmental factors. Branched chain alkylbenzene sulfonates (ABS) are much more resistant to such decomposition than are linear alkylbenzene sulfonates (LAS) in which the long straight alkyl chain is readily attacked by bacteria. If the branching is at the end of a long alkyl chain (isoalkyls), the molecules are about as biodegradable as the normal alkyls. The alcohol sulfate anionic detergents and most of the nonionic detergents are biodegradable. Among pesticides the organo-

phosphorus types while highly toxic are more biodegradable than DDT and its derivatives. Tests on a number of compounds gave results as follows: Easily biodegraded: n-propanol, ethanol, benzoic acid, benzaldehyde, ethyl acetate. Less easily biodegraded: ethylene glycol, isopropanol, o-cresol, diethylene glycol, pyridine, triethanolamine. Resistant to biodegration: aniline, methanol, monoethanolamine, methyl ethyl ketone, acetone. Additives that accelerate biodegradation of polyethylene, polystyrene and other plastics are available.

bioengineering. Application of the principles and methods of chemical engineering to biotechnology.

bioelectrochemistry. Application of the principles and techniques of electrochemistry to biological and medical problems. It includes such surface and interfacial phenomena as the electrical properties of membrane systems and processes, ion adsorption, enzymatic clotting, transmembrane pH and electrical gradients, protein phosphorylation, cells, and tissues.

bioethics. An interdisciplinary science for which research facilities were established in 1971 encompassing the ethical and social issues resulting from advances in medicine and the biosciences. Its scope includes a number of areas of importance to chemistry, e.g., reproductive and genetic phenomena, organ transplants, gerontology and antiaging techniques, biological warfare, contraception, etc. The Kennedy Institute at Georgetown University, Washington, D.C., is the chief center for information about this developing aspect of biomedical science.

bioflavonoid. A group of naturally occurring substances thought to maintain normal conditions in the walls of the small blood vessels. The bioflavonoids are widely distributed among plants, especially citrus fruits, black currants, and rose hips (hesperidin, rutin, quercitin). They have little or no medicinal value.

biogas. Methane ganerated from animal manure by bacterial anaerobic digestion. Small-scale units have been in use for some years, and the possibilities of utilizing the tremendous quantities of manure available in the US as an energy source have stimulated investigation of large-scale production. One installation utilizing a thermophilic fermentation technique at 55–60C has been operating in Florida since 1979, and another in Colorado since 1981. This energy source is also being exploited in China and India.
See also biomass.

biogeochemistry. A branch of geochemistry dealing with the interactions between living organisms and their mineral environment. It includes among other studies that of the effect of plants on weathering of rocks, of the chemical transformations that produced petroleum and coal, of the concentration of specific elements in vegetation at some time in the geochemical cycle (iodine in sea plants, uranium in some forms of decaying organic matter), and of the organic constituents of fossils.

biogenesis. See life, origin.

biogenic sediment. Sediment consisting of mineral grains that were once parts of organisms.

bioinorganic chemistry. Study of the mechanisms involved in the behavior of metal-containing molecules in living organisms, e.g., biological transport of iron, the effect of copper on nucleic acid and nucleoproteins, molybdenum and manganese complexes, etc.

bioluminescence. See chemiluminescence.

biomass. Any organic source of energy or chemicals that is renewable. Its major components are: (1) trees (wood) and all other vegetation; (2) agricultural products and wastes (corn, fruit, garbage ensilage, etc.); (3) algae and other marine plants; (4) metabolic wastes (manure, sewage); and (5) cellulosic urban waste. Conversion of these is performed in several ways: (1) by combustion (heat); (2) by fermentation (alcohol); (3) by gasification (synthesis gas); and (4) by anaerobic digestion (methane).

In terms of energy, wood is by far the most important component of biomass. It has become a significant source of industrial heat, e.g., in paper mills and power plants, and intensive cultivation of trees for this purpose is under way. Wood is also a potential source of alcohols; ethyl alcohol is produced from wood on large scale in Brazil as a gasoline substitute. Agricultural wastes are fermented or gasified to synthesis gas, manures and municipal waste yield methane (biogas) on digestion. In 1981, biomass supplied 3.5% of US energy requirements and this is expected to increase substantially.

biomaterial. Any material suitable for use as a surgical implant within the body to replace or support joints or tissues. They include such metals as aluminum, stainless steels, titanium, various forms of carbon, and especially plastics (polycarbonate, polyurethane, nylon, silicones). They have been used successfully in many areas of the body from hip and knee replacements to mas-